PRODUCTION CONTROL

in The Black & Decker Mfg. Co.

By William A. Rowe, Production Manager

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Production Control in The Black & Decker Mfg. Co. *

By William A. Rowe, *Production Manager*

OUR business could not have attained its present state of efficiency without some sort of production control. Its diverse nature is such that its successful operation is dependent upon simple, efficient and flexible production control methods. We recognized this fact eight years ago when the counterpart of our present production management system was installed. I say production management system because at our factory production control is not confined to departmental limitations, but embraces all branches of the business, in that its success depends upon the harmonious blending of the knowledge and experience of both factory and sales executives.

We manufacture portable electric drills, screw drivers, valve refacers, bench grinders, etc., our line comprising 54 varieties of units, sold in quantities from 50 to 25,000 per year (exclusive of accessories). We are expected to maintain a minimum stock on each of these units because prompt delivery is essential in our business.

We distribute through jobbers, and it is part of our sales policy to allow freight on all shipments of 100 pounds or more, and these shipments invariably do not include units of a like nature. We do our utmost to uphold this part of our sales policy to make it effective and at the same time endeavor to reduce to a minimum, back orders and their consequent evils. We feel that quick turnover in our jobbers' stocks means greater volume for us, therefore we strain every effort to see that the jobbers secure the merchandise on time to meet demands of the trade.

It is obvious that a system to cope satisfactorily with a condition of this kind must be both simple and flexible. Experience has taught us that no hard and fast rules can be adhered to, but the system must be such that it can be altered easily to meet fluctuating conditions in the business. Our system which we have perfected from year to year, has successfully, met all the requirements of our business, and through it we have been able to maintain our yearly increases in business. Last year through our method of control we produced 90,000 units in approximately 60,000 square feet of floor space with 450 employees. We sold 88,000 units, our average weekly orders being 1,600 against 1,700 for weekly production. We aim for uniform production throughout the year and endeavor to parallel sales closely as possible. We usually sell 60 per cent of our product in the first six months.

We do not depend entirely upon our production system for results, we feel that the personal element is absolutely necessary in all production systems and the bigger we grew the more we realized this fact. Our factory executives make it a point to keep in close contact with shop supervisors and employees so as to be familiar with all shop details.

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It is our aim at all times to increase production, improve quality and cut the cost. We employ only unskilled help in our factory under the supervision of skilled department heads and assistants, and we see to it that each and every department head and assistant keeps in close touch with the operator to see that he is properly instructed in all details pertaining to his work. To insure this being done we restrict, wherever possible, the personnel of each department to not more than twenty employees. We also relieve our department heads of all planning and scheduling whenever possible. We have found these methods productive of good results and the department head and assistants have ample opportunity to see that the department is functioning efficiently. The shop superintendent and department heads are also responsible for shop discipline.

We manufacture on the lot system basis and to finished unit stock, employing the straight line methods, in that the material enters the factory in a raw state and leaves in a packing box ready for shipment, and in order to fabricate the parts in a limited time, we employ the overlapping system of manufacture, paralleling a given number of units of different sizes through the shop at one time.

We operate under the hourly system of wage payment and offer no incentives other than a prompt attendance bonus which we give all hourly workers who report on time for duty and lose no time during the week. This bonus amounts to one dollar per week.

It is for the successful coordination of all these elements that the following production control system was devised:

The first and leading factor in our production control system is the sales quota sheet.[1] This sheet is compiled one or two months prior to the beginning of each year. One estimate is made up by the sales executives and one by the factory executives. The two estimates are compared and usually a compromise estimate is adopted. This estimate of course states the total number units of each kind to be sold and the percentage sold the first and last six months of the year. The estimates are arrived at through statistics and general knowledge on the part of both the sales and factory executives of outside conditions, also conditions of our jobbers' stocks which stocks are reported monthly. These estimates are revised once a month at a meeting of the factory and sales executives including the president and vice-president of the company. We find this a very effective means of control and it also permits both divisions of the business an opportunity to enter into a general discussion of all phases of the business.

Our first consideration after our sales estimate for the ensuing year is decided upon is to make provision for the execution of this schedule in the factory, which invariably means additional equipment. In order to determine just how much additional equipment is required, we use a chart classed as a machine and man load chart, containing the following information: first we estimate the total number of parts to be fabricated at our factory on each unit, then the total number of operations performed on each part and which machines and departments these various operations are performed by, also the number of pieces machined per day per machine. For instance operation one on ten different parts to be performed on a 1¼" Screw Machine and the total number of pieces equals 100,000 for the year. If we only have machining capacity of 50,000 it becomes evident that additional 1¼" machine equipment will be required to complete the schedule. All subsequent operations on these parts are similarly worked out. Solving machine problems in this manner enables us to balance our equipment in all departments and eliminates congestion and so-called bottle neck conditions, insuring uniform flow of material at all times. If during the year our sales should exceed our estimate, additional equipment of course is added to take care of the increase providing we feel it is permanent.

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[1] A set of the forms mentioned in this paper which were exhibited at the meeting may be borrowed from the office of the Association by any member who is interested in seeing them.

Manufacturing Control Chart

Our next step is the governor or semaphore of our production control system, because it tells us when to go, when to use caution and when to stop; it regulates our inventory, flow of material through the shop and our finished stock. Through this medium, known as our manufacturing control chart, the unit, lot number, quantity in the lot, estimated sales per week, date quantity is exhausted, minimum stock, starting and finishing assembly dates, date on which to authorize new lots of material, date material is required for fabrication and average weekly sales are provided for. It is through this method that we double check the yearly sales estimate and it is apparent that no wild guessing can be permitted because the success of the whole production control system depends upon the accuracy with which this information is compiled. Our lot sizes are determined as scientifically as possible, based on set-up cost, interest on investments of finished stock, average weekly sales on each particular unit and shop capacity. The governing factor on this sheet is the average sales per week. Our object in including the average number of units sold each week is for the purpose of checking against our yearly estimate of sales. If this is under or in excess of the actual number of orders received, our future production schedule of lots is adjusted accordingly. This likewise effects the authorization of new lots and the ordering of material. While very simple, this form is very serviceable. A glance at the sheet will indicate just how near our estimates compare with the actual conditions. It is possible for us with this sheet to plan considerably in advance, as we are able at any time to furnish information as to when any future lot will be authorized for production and just what the assembly date will be. I might add that our minimum stock is also adjusted should sales warrant us so doing.

The next form used to advantage in our production control system is classed as our production schedule and stock report. This form records the following information: size of the unit, number of unfilled orders, voltages, stock, lot number, number in lot, number completed and starting and finishing date. We make ten copies of this form and distribute them at our weekly factory meetings consisting of Vice-President, General Manager who acts as Chairman, Chief Engineer acting as Secretary, Production Manager, Assistant Production Manager, Electrical Engineer, Purchasing Agent, Service Manager and Shop Superintendent. The two other copies are forwarded to our Canadian Assembly Plant and Order Department. This form can easily be classed as a ready reference sheet for all factory executives, because it keeps them informed in an up to the minute fashion with factory conditions. It is at these weekly factory meetings that the Production Department advises what additional lots to authorize for fabrication, specifying the quantities and giving the assembly dates. Before authorization of any lot is approved, everything is considered with respect to change of design, requirements based on orders received, finished stock, unfilled orders, etc. Unquestionably this form has proved a very valuable asset to our organization. Through this form the vice-president and general manager is able to keep abreast of factory operating conditions. Any weak spots can be easily pointed out so that corrective measures can be quickly adopted. All factory executives have this sheet with them constantly and when out of town, should any of our salesmen or branch managers require any information as to the status of production of any particular unit that we manufacture, the information is readily available from this form.

After manufacturing lots are authorized the Assistant Production Manager in charge of planning prepares specification sheets designating the amount of material required to complete the unit. This sheet, similar to a bill of material, is presented to the purchasing Department and they indicate just what items they have in stock and to be bought, specifying delivery dates. The Purchasing Department has charge of the Store Room, also the inventory system. The sheet is returned to the Production Department and with the master route and operation cards, the production clerks prepare the master control chart, manufacturing and store room requisitions, operation, planning board cards and move tags.

Planning the Work for the Factory

The next procedure is planning the work for the factory. This is accomplished through the use of a planning board, master control chart, board cards and date pins.

Jobs are assigned to machines best adapted to perform the operation. Before the jobs are assigned, however, reference is made to a master layout sheet which indicates the parts that take the most time to complete. These then are assigned first. Due consideration is given to such matters as machine loads, machines ahead of schedule, etc. No job is advanced to first place on the board unless material, drawings and tools are available. This information is furnished through the master control sheet.

Operation of Planning Board

Our planning board is so arranged as to make it an easy matter to change jobs. It operates like a checker board. Any unbalanced condition is immediately revealed and can be quickly adjusted. After jobs are assigned the finishing date is indicated through the use of a green pin. These planning boards on a less elaborate scale are duplicated in the various departments in the shop, wherever the initial operations on the part are performed, also the Gear Cutting Department which is not necessarily an initial operating department, but where conditions make the use of such a board an absolute necessity. When the operator or department head is ready for the next job, he goes to the workahead board, takes the store room requisition, forwards it to the store room and has the material delivered. Any changes made on the office planning board of course are immediately taken care of on shop workahead boards.

With the master control sheets we get a complete picture of the conditions of the parts comprising the units. This sheet informs us where we stand on material, drawings, tools and the progress of the work in the shop. It indicates the date on which each operation is completed, total number of units completed and scraped. We are also able to determine by the stop lines the total number of operations required for each piece. The master control sheets worked in conjunction with the planning board prove very effective.

The operation card which accompanies the store room requisition in the shop does not accompany the material in its course through the factory, being only a departmental operation card. As soon as the operation card is forwarded to the Cost Department from any particular department, it enables us to get a departmental operation cost and it is not necessary to wait until the complete unit is finished. Our method of manufacture makes departmental operation cards a necessity.

In order to identify the parts we use a move tag, which thoroughly describes the part in process.

Special and Service orders are followed through the factory on red and green cards. Planning board cards are also of these colors. Green and red card jobs are given preference over standard units.

Our assembly foremen are supplied each week with a schedule specifying which units and the quantity of each to be assembled that particular week on each assembly bench in their respective departments, assembly benches being numbered Nos. 1, 2, 3, 4, etc.

After the units are finally assembled and tested, the number completed is reported each day to the Production Department and this information is summarized weekly and recorded in our production record book together with the number of orders received for that particular week. From this information we make a production report containing the following: units produced, shipped and stock on hand. The Order Department makes a similar record specifying the number of orders received, gross and net unfilled and consignments. We also use this information for statistical purposes.

Methods Devised for Improving Operations

In addition to routing and scheduling the work through the factory we are also responsible for costs. In order to keep within our cost limitations, methods must always be devised not only to decrease and improve operations, but also little schemes having a tendency to speed up production. One scheme was introduced in our Screw Machine and Chucking Machine Departments, which was about two months ago; before extending it to the other departments we wanted to assure ourselves that it would prove worth while. This little plan has met our expectations in every respect. What we did was to place a board on each machine containing the following information: machine number, date job is to finish, production per day, on schedule and behind schedule. When a machine is on schedule it is indicated by a white mark, and when behind schedule by a red mark. Of course through this method we appeal to the pride of the operator and it has proved very effective. The results for the last five weeks are as follows:

Percent of Schedule

(1)
Week of March 18th to 24th
SM Dept....On—90% Behind— 9%
Ch. Dept....On—98% Behind— 2%

(2)
Week of March 25th to 31st
SM Dept....On—82% Behind—18%
Ch. Dept....On—95% Behind— 5%

(3)
Week of April 1st to 7th
SM Dept....On—87% Behind—13%
Ch. Dept....On—94% Behind— 6%

(4)
Week of April 8th to 14th
SM Dept....On—87% Behind—13%
Ch. Dept....On—94% Behind— 6%

(5)
Week of April 15th to 21st
SM Dept....On—94% Behind— 6%
Ch. Dept....On—95% Behind— 5%

The results attained in these two departments have encouraged us to extend the system to the other Machine Departments in the shop. In the Assembly Departments we also have boards on which are indicated the lot number of the unit, number in the lot, start and finish assembly dates and the production per day. This enables each and every operator on the assembly benches to see what is being done and also the time allowed for accomplishing the task.

This sums up in detail our method of production control, and I might say that on the whole we have found it to be very satisfactory and are constantly improving it to meet any new conditions arising in the business.

DISCUSSION

Chairman Oscar Grothe (White Sewing Machine Corp.): A point in question is whether or not Mr. Rowe is working on a day work basis. If you do not plan your subsequent after your beginning operations, how do you keep a balanced labor control or condition in your institution?

Mr. Rowe: We work on the hourly rate basis. The only incentive we offer is a bonus for prompt attendance. That is, if an hourly worker reports for duty at eight o'clock in the morning and loses no time during the week, we give a dollar bonus each week. That bonus, when earned, is deposited in a building association and it is subject to withdrawal by the employee whenever he or she desires. The object is to encourage thrift. Many of our employees have taken advantage of this plan. Some have credited to their account from $500 to $600.

As to how we take care of our labor, I might say that in the last three months our labor turnover has amounted to about one-half of one per cent. We actually lost, I think, about eighteen people in three months, nine of whom were laid off because we discontinued a temporary night force. Those employed understood the jobs were only temporary. Actually we lost nine for various reasons—discontent, or they did not like the work. We are located in the suburbs and draw mostly on absolutely unskilled country labor. We employ about sixty girls in the factory. Our work is highly specialized. Generally we employ female help on assembly operations and a certain percentage of female help on drill presses, grinders, gear shapers and subassembly operations. In this particular sphere we find women preferable for they are apt, quick, neat and very careful with their work.

Generally speaking we have very little trouble with labor turnover. Although about four or five years ago labor turnover, particularly in the spring, was quite an item. The fact was that a number of our employees, residing in the country district of Towson and vicinity, availed themselves of the spring weather in preparing their gardens. In other words they could not resist the call of the soil. We remedied this condition and ever since, as stated above, our labor turnover has not been much of a problem.

CHAIRMAN GROTHE: How do you know, if you have not planned your subsequent after the so-called beginning operations, whether or not you have the proper amount of labor? How can you tell whether you have too much of it there at times or not?

MR. ROWE: We determine that from the master control chart. As soon as the material is moved from the screw machine it goes to the next department to perform the subsequent operations. The machine follow-up man notifies the foreman what jobs to schedule for the various machines. If he finds we have not enough machines in that department, we have a consultation to determine whether or not the job is of sufficient importance to warrant overtime work or wait until the machine is ready to take care of it. We usually find that we can take care of it.

We also determine machine capacities through a capacity and man load chart which we use at the beginning of the year when working up our sales quota. This chart enables us to determine the amount of equipment required to perform initial and subsequent operations in all departments. The nature of our business is such as to make it necessary for us to keep a small percentage of equipment available for small experimental lots of tools. These small lots of tools are for new applications and must be rushed through quickly. We also have service and accessory parts to consider in our manufacturing scheme. Service parts receive priority over standard units.

MR. JOHN STEENDAHL (Benjamin Electric Manufacturing Company): Your production control system controls about how many catalogue numbers or devices?

MR. ROWE: Fifty-four tools, which may have parts ranging anywhere from 150 to 200.

MR. STEENDAHL: You have fifty-four catalogue numbers. How many parts—20,000 or 30,000.

MR. ROWE: I should say around 18,000 to 20,000.

MR. STEENDAHL: And eight clerks handle your control production department?

MR. ROWE: Yes.

MR. STEENDAHL: You referred to your control of the costs. How do you determine, or when do you determine when your costs are not being made? After your job has been completely costed or during the process?

MR. ROWE: At the completion of the lot. We work on standard costs.

MR. STEENDAHL: If an operation is going on in the factory and it is not being met with your production rates, does your foreman or anybody stop the job? Is there any way during the day, two or three days during the operation, by which you can detect jobs are running under or over cost?

Mr. Rowe: We determine that the machine should do so many pieces per day. If it does not we shall know it the next day through our operation card, which is checked up every morning.

Mr. H. K. Eastman (The Hills Brothers Company): Did I understand office and factory are combined at their plant? With that system it might work where office and factory are combined, when it would not if they were separated. You would not then have the opportunity for frequent conferences with your sales department and office force. If, for instance, your office was in the city and your plant in the country, could you use that same system and get your rush work through in that same way or would you not suffer as a result of lack of consultation or conference with your higher executives and your sales force?

Mr. Rowe: I do not think so. I can best answer that by the way we handle our Marschke plant. We work it on the same basis, and we are 600 miles away from Indianapolis. We also have a Canadian assembly plant. We send up parts to assemble. We work from sales records the same as we do at our Towson factory and determine our schedules on that basis.

From our Canadian factory we get reports once a week of amount sold, units in stock, and we arrange our shipping schedules of parts on that basis. Our Canadian factory can at all times make prompt shipments.

I have before me a Marschke schedule and can tell you just which lots they are working on, when they will start the next lot, quantity in the lot, what their stock is, and what the unfilled orders are. We know that every week. If anything extraordinary happens which we think needs prompt attention, we use the wire.

We took over the Marschke plant a year ago January. Prior to taking over the plant, I think they did approximately $60,000 worth of business the previous year. We installed a modification of this system with practically the same foundation. We make there grinders weighing anywhere from 300 to 2,500 pounds. This is quite a departure from our business in Towson—for us it is an entirely new field, and I think we are doing what is seldom done in that class of business—making prompt shipments upon receipt of order. We are carrying out the overlapping system of operation there the same as we do in our Towson plant.

When we took over the line our sales department got busy and, of course operating through jobbers, there is always an immediate prospect of a lot of orders being received shortly after the line is announced. We renovated the plant and began operation on an extensive scale in February. In March we announced it to the trade and got a flood of orders. We were behind for six weeks. After that we gradually accumulated a stock and now we carry three and one-half to four weeks' stock. When we took over the plant, we employed 95 people in the operating department alone, we now employ 45 and have increased our production nearly 400 per cent.

Mr. C. H. Brookes (Chicago Flexible Shaft Company): In view of that last remark of once having employed 95 and now employing 45, with a production increase of 400 per cent, I would like to ask whether you have been able to accomplish this under the hourly scheme of wage payment which, as I understand it, is purely a wage of 50 cents an hour, say, without any incentive whatsoever? Whether you just used this base rate of 50 cents an hour and accomplished this result?

Is there some method of checkup through time studies as to whether the accomplishment each hour by the operator is in accordance with the time studies that have been taken.

Mr. Rowe: Yes, through the operation cards. We determine on the operation cards the amount of time each operation should take. Then we hold the foreman responsible to make that point.

Our average rate is higher than 50 cents due to the fact that mostly skilled labor is employed at the plant. In manufacturing grinders the equipment is entirely different than that used in manufacturing portable electric drills, but as in the manufacture of drills close tolerances are necessary.

Formerly when the job went out into the shop they had no realization whether it should take two or three minutes, or two or three hours. The operator never knew what time he took to finish. Now we furnish a man with the operation card specifying the number he should complete each day with the time he should do it in. We also furnish the foremen of both assembly and machine departments with cost sheets and cost estimates in order to keep them posted. With the new cost sheet of the previous lot he can determine the progress made, if any. Through this method the foremen can see if they have exceeded or are under our estimate.

Another thing. We do not manufacture to a finished part stock. We have all been through the automobile plants and know that workers are constantly yelling for material. This keeps the assembly foreman on his toes after the material follow-up men, and the material follow-up men are persistently after the machine foremen. We hold the assembly foreman responsible for the results in his department. If he cannot get these results, he complains to the office about the shortage of material. Naturally the production department follow up and get this material. Somebody constantly keeping behind somebody else cannot help but be productive of results.

We have a lot of spirit in our organization. We believe every business should have a little romance about it. There should not be too much mechanical routine. Inject a little romance and spirit into the business and let the man feel that he is not just a machine but actually a part of the organization.

We have no incentive system. We have nothing against it but we do not feel that our business justifies it. We let a man feel he can make just as much on a machine by producing what he is supposed to produce on the hourly rate basis, as he can on the piece work basis. If it is in the man, if he believes in and is loyal to the organization and understands what costs are—that you cannot pay high wages unless you make profits—he will produce and prove a faithful worker.

We have a monthly foremen's meeting both at the Towson and Marschke factories. Any detail pertaining to costs is read out at these meetings. We have found since applying this scheme to the Marschke plant that we have improved the quality of the product. The men are not only better workmen, as I said before, but they understand more about manufacturing than they ever did. They had no realization of what costs were. We make everybody in our organization—foremen, sub-foremen, and, if necessary the operator—understand just what we are up against. Let them see the picture. We are not afraid to show them the cost books any time they ask for them.

Mr. W. J. Donald (American Management Association): I would like to ask one question. Mr. Rowe said that the shipping expense was covered by the company—

Mr. Rowe: You mean our freight allowance. That is practically true. There are exceptions, yes—go on, finish your question.

Mr. Donald: If it is under a certain value or weight the purchaser has to pay it, or at least part of it. Suppose the production department gets behind on schedule so that you have excessive freight charges. To whom are these charged?

Mr. Rowe: To the production department. That is our shortcoming. We are responsible for it. That shows up every month, too, on our factory allowance budget.

That freight allowance works this way: on 100 pounds of freight to New York City we pay about 53 cents. Suppose we are compelled to split the shipment. Instead of that shipment costing us 53 cents it will cost $1.06. In other words, 53 cents more than it should. We ship F. O. B. Towson, and credit it to the jobber's invoice at the end of the month. You can see that we have to have the stock on hand. Of course there are occasions when we slip; but if we slip too often and our surplus freight charges increase from month to month, the general manager sees it and we have to do the Charleston on the carpet. If you ever did that, you know what it is.

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